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The HMQ: Measuring Health Status in the Community

by

Paul Kind and Claire Gudex

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Paul Kind and Claire Gudex

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AUTHORS

Claire Gudex and Paul Kind are Research Fellows in the Centre for Health Economics, University of York.

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ABSTRACT

The measurement of health outcome is central to the evaluation of medical treatment and intervention. In the past, such measurement has been based on data relating to survival and life expectancy. There is now general acknowledgement that a thorough assessment of the benefits of health care must examine the quality of life, as well as its quantity.

The Health Measurement Questionnaire (HMQ) has been developed as a way of collecting self-report information from which a disability/distress rating could be derived on the Rosser Classification of Illness States. This discussion paper provides a fuller review of the data collected as part of a general population survey in which the HMQ was used as a self-report measure of health status alongside the GHQ and the NHP.

The HMQ appears to have both construct and convergent validity. It has also discriminated between groups of the population which differ in terms of health status or in the degree of psychiatric morbidity. Several factors have been shown to contribute to overall distress, particularly pain, sadness/depression and dependence on others.

It is evident that there is considerable morbidity in the community. These data reinforce the need for continued measurement of health status within the general population, with the dual aim of identifying areas of need, and then monitoring improvement as services are adjusted to meet that need.

THE HMQ: MEASURING HEALTH STATUS IN THE COMMUNITY

INTRODUCTION

The measurement of health outcome is central to the evaluation of medical treatment and intervention. In the past, such measurement has been based on data relating to survival and life expectancy. There is now general acknowledgement that a thorough assessment of the benefits of health care must examine the quality of life, as well as its quantity.

The literature is growing steadily in the area of application of health status or health-related quality of life measures to assess benefits of medical care, and there are now several 'standard' measures from which to choose. Standard in this context means simply that the measures have been developed following systematic enquiry, have used accepted methodologies, and have been used in a wide range of patient groups.[1,2]

The application of health status measures is not restricted to patient groups however. Within both hospital and community care, the area of preventive medicine is playing an increasingly important part. This covers such activities as assessment of risk factors, screening for disease, and health education, and it focuses on the general population rather than on patients with a particular disease. There is a concern that, for various reasons, much ill-health exists in the community which is not being recognised by the health care system.

There has been growing interest in describing the health of the general population[3-5], for example the General Household Survey[6] ,conducted each year in the UK, collects information about health and illness generally. The aim of more recent studies has been to quantify this health status i.e. to ascribe either a series of numbers to various health dimensions,[7,8] or to generate a single number to represent health status.[9,10]

The Rosser Classification of Health States[9,11] was developed in the UK in the 1970s, and has been used subsequently as the basis for the measurement of health-related quality of life (QoL) in the estimation of Quality-Adjusted Life Years (QALYs).[12,13] It consists of two dimensions of health - disability and distress, with eight and four levels of functioning respectively (see Figure 1). Each combination of these levels has been valued, and the resulting matrix of scores is shown in Figure 2 (see footnote). Each number represents the value or 'utility' of being in a particular health state, where a score of 1.00 reflects full health (no disability and no distress) and a score of 0.00 represents death. (It can be seen then that there are two states considered to be worse than being dead).

In its original form the classification was intended for use by a professional medical observer to rate the health status of a patient in hospital. However when surveying the general population, a self-rated measurement tool is more appropriate than an observer-rated scale. The Health Measurement Questionnaire (HMQ) was developed at the Centre for Health

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Footnote: at the time of writing, an updated valuations matrix is being prepared, based on a partial replication of Rosser's original valuation method. Those interested in obtaining a copy of the revised matrix should contact the authors.

Economics as an alternative way of collecting relevant information from which a corresponding Rosser disability/distress rating could be derived. In the case of the distress dimension, an expanded list of 'feelings' items was incorporated to explore further the definition of 'distress'. The HMQ has been described in a previous discussion paper[14] and is reproduced in the form in which it was used in this Wolverhampton Study in Appendix 1.

This discussion paper reports on the use of the Health Measurement Questionnaire (HMQ) in measuring the health status of the general population. It provides a fuller review of the data collected as part of a survey in which the HMQ was used as a self-report measure of health status. The validity of the HMQ is examined by comparing these results with other data obtained in the same survey, including the GHQ and NHP as alternate measures of health status.

THE WOLVERHAMPTON STUDY

As part of a survey carried out in Wolverhampton[15] respondents completed a battery of questionnaires aimed at assessing general health status and health-related quality of life. In this study, a systematic random sample of 801 were contacted from the Wolverhampton electoral register, of whom 430 were interviewed in their own homes, during October and November 1986. In the main part of the survey, information was collected on health behaviour, life events, self-report medical history, as well as on sociodemographic variables such as employment and marital circumstances. These data are referred to here as the 'core data set'. In addition, respondents were asked to complete either the General Health

Questionnaire[16] (GHQ), or the Nottingham Health Profile[7,17] (NHP), and all respondents completed the HMQ.

RESULTS

1. Characteristics of the Study Population

Table 1 shows that the respondents were fairly representative of the general population of England and Wales with regard to age and sex distribution. There were more respondents in socio-economic group III (manual and non-manual), but fewer categorised as 'other'. This is probably due to women in the study group being classified according to their last job, rather than as 'housewife'. There were fewer respondents in full-time jobs, fewer who own houses, and more who were assessed by the interviewer as being Asian or Afro-Caribbean.

Table 2 shows the distribution of the respondents on selected health variables. Forty-five per cent of respondents reported longstanding illness (c.f. the figure of 33.4% from the General Household Survey),[6] and one-third were on regular medication. Less than half of the respondents had a body mass index within the 'ideal' range of 20 to 24. The data obtained from the HMQ were converted into equivalent Rosser disability/distress categories using the decision rules described in Appendix 2. Table 3 shows the distribution of derived Rosser distress and disability categories within the overall Rosser matrix. One quarter of respondents were categorised as having at least some disability on the Rosser classification, while nearly half had at least some distress.

Relationship between background characteristics and Rosser score

The scores for each Rosser disability/distress state were substituted for the category derived from the HMQ algorithm and mean scores computed for various subgroups of the study population. The results are summarised in Table 4. This shows that Rosser scores were significantly lower for older respondents, those who left school at or before compulsory school leaving age, those who were not home owners, or those who were below social class III Non-Manual. In addition, those who were sick (temporarily or permanently) or disabled, or who were seeking employment, showed significantly lower scores than those whose usual activities are paid employment, housework, education, or who were retired.

Scores were also significantly lower for many of the health related variables, and particularly the following health behaviour variables: i.e. current or ex-smokers, outside the normal range for body mass index, having long-standing illness, taking regular medication, not participating in regular physical exercise.

2. Validity of HMQ Responses: Comparison of HMQ Data with Core Data

In testing the performance of the HMQ against other schedules designed to elicit similar information, respondents' results recorded in the HMQ were compared with information recorded in the core data set, which had been collected in the initial stages of the interview.

There were several instances where the same or a similar question was asked in both the core data set and the HMQ. The responses to these questions were analysed, and, as would be hoped, revealed few inconsistencies between the data sets. However some of these are worth looking at in more detail, as they highlight two particular issues which are pertinent to any study using an observer or self-report questionnaire.

Firstly, some respondents gave incompatible answers to the same question asked at different points in the interview. The question, "What is your usual main activity?" was asked in both the main section and the HMQ, and the answers should therefore be the same each time. Although nearly all respondents did give compatible answers, there were four who did not e.g. did full-time employment on one answer but did housework, were retired or were in education according to the other answer. Perhaps one of the questions was misunderstood, or the respondents' definition of 'usual activity' changed as a result of intervening questions. Whatever the reason, it raises the problem of which answer is the appropriate one to use (especially if you cannot go back to the respondent in the event of an anonymous postal survey), and even more importantly, questions the reliability of both the respondent and the question schedules.

The second issue concerns the language used in questionnaires, and acts as a reminder that the meaning of a question may seem obvious to a researcher, but that the respondent may have quite a different interpretation.

It was anticipated that there would be a positive correlation between the rating of own health status in the core data set, and that recorded as part of the HMQ. Table 5 shows the questions being compared in which the reply to AV14 has been taken as the "correct" answer. For the sake of brevity the questions are referred to by their variable name used in the SPSS analysis. Responses to gv33 and gv34 identify quite well the respondents who are in 'Excellent' or 'Good' health (high specificity and few false positives), but they do not readily identify the respondents with 'Fairly Good' or 'Not Good' health over the last year (lower sensitivity and more false negatives). This may be due to the different time periods used in the questions, or perhaps some respondents place a low weight on health in its contribution to overall QoL.

Respondents in Poor Health

A group of respondents were identified as being in a sub-optimal health state on the basis of their answers in the core data set. A test of the HMQ's validity is whether these respondents also score poorly on the variables in the HMQ, i.e. on disability, distress, overall quality of life, and Rosser score, as well as on another variable from the core data set, general health (av14). Respondents were identified as being in a sub-optimal state AT THE TIME OF INTERVIEW IF

(i) they were registered disabled, n=25

or (ii) their health had caused them to cut down their usual activity over the previous two weeks, n=75.

or (iii) they were prevented by temporary sickness from seeking work, n=0

or (iv) they were permanently sick or disabled, n=19

or (v) they had experienced an undesirable decline in physical ability in the previous three months, n=50

On the basis of these characteristics, 107 respondents out of the total 407, were identified as being in a sub-optimal health state (52 people fulfilled more than one criterion).

Table 6 shows the distribution of derived disability/distress categories for respondents in each of the 2 subgroups. Around 15% of the "healthy" group are categorised into disability states II or lower, compared to over 50% of the "not-healthy" group. Roughly equal proportions of this second group are assigned to disability levels II, III and V, but less than 5% are categorised in level IV. This probably results from the requirement (according to the original Rosser classification) to categorise individuals who cannot work into disability level V. It might be that some of those so categorised would otherwise be placed in disability level IV. Just over 60% of respondents classified as "healthy" are deemed to have no distress - double the proportion found in the "non-healthy" group. Whilst the proportions in distress categories B - D progressively reduce in the "healthy" group, they remain broadly constant for the "non-healthy" group.

Results of t-tests showed that the respondents in a sub-optimal health state have significantly poorer general health status (gv34), self-report overall distress (gv33) and QoL, as well as scores based on the Rosser Index, than respondents categorised as "healthy" ($p<0.001$ in each case).

3. Convergent Validity: Comparison of Derived Rosser Categories Against GHQ and NHP

For this part of the data collection, approximately half of the respondents completed only the GHQ (n=188), and a similar number completed only the NHP (n=185). Twelve respondents completed neither, and 22 completed both questionnaires.

Both instruments yield scores which are produced by counting item responses. In addition, the modal response to the NHP questionnaires was found to be zero, and distribution of responses to individual dimensions were skewed. Hence the data for these variables have been treated as ordinal, and the median has been used as a measure of central tendency.

Comparison with the GHQ

The GHQ[16] was designed to be a self-administered screening test aimed at detecting psychiatric disorders among respondents in community settings, and thus focuses on psychological components of ill-health. Scores for the GHQ are calculated by counting the number of times a respondent answers 'more than usual' or 'much more than usual' to 12 questions. Scores can thus range from 0 to 12. Respondents with a score of 3 or less are considered to be within the normal range, and those with 4 or more are considered to have a psychiatric problem.

Fifty-nine per cent of the 210 respondents scored zero on the GHQ, while thirteen per cent (n=26) scored higher than 3. Table 7 shows how the median GHQ scores compare with

the Rosser disability and distress categories. As expected, the GHQ score rises as the level of distress worsens, although the relationship with disability is less clear. Table 8 shows the Rosser categories of the 26 respondents with a GHQ score greater than 3 (and thus considered to be 'psychiatric cases'). Only one of these respondents was in distress category A (no distress), while 14 others had no disability but some degree of distress. Ten of the 26 were in the 'severe distress' category.

Spearman's rank correlation between the Rosser scores and the GHQ scores was -0.43, ($p<0.001$), and it is in the expected direction, with GHQ scores rising as Rosser scores decrease.

Comparison with the NHP

The NHP[7,17] is a self-administered questionnaire which was designed to measure perceived health status and the extent to which such problems affect normal activities. Part I of the profile comprises 38 items which are associated with the six categories of sleep, physical mobility, energy, pain, emotional reactions, and social isolation. A set of weights has been derived to reflect the perceived severity of the items within each category,[19] but the weights have not been used here. In this analysis, a score for each of the six categories is derived by counting the number of positive responses to the constituent items. These category scores were then aggregated to obtain an overall NHP score.

From Table 9 it can be seen that as with the GHQ, the median NHP score increases as the Rosser disability and distress categories worsen. The scores for disability level IV

appear to be anomalous, and may be explained by the classification rule regarding inability to work, and by the smaller number of respondents in this level. The median scores for each of the individual NHP components also tend to increase as the Rosser category worsens, although the scores appear to discriminate poorly between the top two levels of disability and distress.

The modal response to the NHP questionnaire has previously been shown to be zero with respondents in a community survey typically replying no to all questions[20] and indeed in this study, nearly 60% of respondents answered "no" to all the 38 items on the NHP. It is interesting to note that for many of the items in the categories 'sleep' and 'social interaction', the incidence of positive responses for this study population were virtually identical to the responses from 1598 adults who completed the NHP as part of a community survey conducted in the York area (see Table 10). Within the four other NHP categories, the Wolverhampton study population had a greater incidence of positive responses than the York population to all items except for 'I lose my temper easily these days'. This suggests that as a group they were experiencing poorer health, particularly in terms of energy/sleep (as shown by the higher percentage responding to the items 'wake early', 'Feel tired all the time', 'Pain at night', 'Forgotten what it's like to enjoy myself', 'Everything is an effort', 'In pain up and down stairs').

Despite these differences between the York and Wolverhampton groups, the ranking of the items according to frequency experienced is similar (Spearman rank correlation $\rho=0.66$ $p<0.001$).

To examine further the relationship between the GHQ, NHP and HMQ, we went back to the healthy and non-healthy groups as defined in section 2 (page 7). Table 11 shows the distribution of NHP scores in the 2 subgroups. As noted earlier the modal response is zero, with over 65% of "healthy" respondents not answering positively to any of the items in the NHP questionnaire. 50% of the "non-healthy" group too, indicated no problems on the NHP, however, 25% of this group scored 12 or over - indicating a problem on a third of the NHP items. The distribution of scores for the 2 groups differed significantly.

Table 12 reports on the 'case/no case' distribution of respondents classified according to their GHQ score. Nearly 98% of "healthy" respondents scored below the GHQ case threshold. Whereas only 2% of this group was classed above the case threshold the proportion was nearly 9 times higher in the "non-healthy" group.

4. Construct Validity: Comparison of Variables within the HMQ

Self-Report Distress and QoL vs Derived Distress and Disability

The results presented so far describe the relationship between the derived disability/distress categories and other measures, external to the HMQ. As well as examining these external relationships there are other data items within the HMQ which should be correlated with those derived categories. For example, respondents rated their overall levels of distress (gv33) and quality of life (gv34). It was expected that both these variables should be associated with the derived disability/distress categories. Furthermore, once the Rosser weights were substituted for the categories, it was anticipated that there should be a negative

correlation with responses to these questions, since the scoring convention for the VAS scales is opposite to that in the Rosser matrix.

Some respondents did not complete the visual analogue scales for distress and quality of life (QoL), and they have been excluded from this section of the analysis, as have respondents with missing variables for disability. 387 respondents had full data for all items.

Results of Kruskal-Wallis tests showed that there were significant relationships between:

(i) Rosser disability and self-rated distress (χ^2=113.5, p<0.001)

(ii) Rosser disability and QoL (χ^2=47.4, p<0.001)

(iii) Rosser distress and self-rated distress (χ^2=68.0, p<0.001)

(iv) Rosser distress and QoL (χ^2=61.7, p<0.001).

The relationship between the scores on the Rosser Index and the scores from each of the visual analogue scales of variables gv33 and gv34 was tested using Spearman's rank correlation test. This was highly significant for both tests, with self-report distress producing a stronger correlation than self-report disability with the Rosser score (-0.53 and -0.41 respectively, p<0.001 in each case). Both the correlations are negative, as the Rosser score decreases the visual analogue scores increase, as health state worsens.

Investigating Components of Distress

Several of the feelings variables showed high correlation with each other (see Table 13). Some of these correlations would be expected in any health status instrument which measured related dimensions, and the findings therefore help to increase confidence in the validity of the questionnaire responses.

For example, tiredness and difficulty sleeping had a correlation of 0.56; anxious/worried correlated with both uncertainty about the future (0.42) and with difficulty sleeping (0.41); while loss of confidence correlated with both sadness/depression (0.43) and embarrassment (0.41). Other significant correlations included sad/depressed with anxious/worried (0.68) and with anger/resentment (0.42); and pain with anxious/worried (0.42). (All the correlations were significant at $p<0.001$).

Just how far, however, do the individual 'feelings' (the components used to derive the Rosser distress category) relate to overall distress (gv33)? It was postulated that distress is a function of several variables. Rosser identified three principle components of distress:

(a) pain

(b) mental distress (anxiety, depression, and "other suffering")

(c) reaction to disability

The variables which were expected to contribute to these components were sadness/depression (gv16), anxiety/worry (gv17), pain (gv18), concern about appearance (gv23), embarrassment (gv25), uncertainty about the future (gv26), anger (gv27), guilt (gv28), loss of self-confidence (gv29), dependence on others (gv30), and dependence on a machine (gv31).

Regression analysis was carried out to look at the relative importance of the individual distress component to overall distress.

In the regression analysis self-rated overall distress (gv33) was selected as the dependent variable; gv16, gv18, gv23, and gv25 to gv31 being the independent variables. The anxiety/worried component was omitted because of its high correlation with sad/depressed (Spearman's rank correlation 0.68, $p<0.001$).

Pain emerged as the largest contributor, explaining 27.4% of the distress component. Sadness/depression and dependence on others contributed to a smaller degree (7.7% and 4.8% respectively), while uncertainty about the future and embarrassment contributed only between 1% and 2% each.

These five factors explain almost half of the distress component (43.0%), and the addition of further variables did not contribute more than 5% to the total R^2. This suggests that either there are factors which are important in 'distress' that have been omitted here, or the question enquiring about 'overall distress' (gv33) has been interpreted by subjects to

include other areas of life besides health state. It is most likely that these two factors are working in combination, and this is supported by an analysis of the 'other problems' which respondents were free to add after the list of distress 'feelings'.

Twenty-eight respondents offered another item under the list of feelings which caused them distress. Of these, twelve specified a family or external event without saying how it caused them distress (e.g. lack of money, unemployment, failed driving test, local council, 'environment', burglary, relationship problems within family). A further 5 respondents did not specify the problem. Of the remaining 11 respondents, 3 mentioned specific symptoms (PMT, loss of balance), and 4 gave items which were considered to be already included in the list of distress feelings (pain, dependence on treatment, concern over family event/death). The remaining 4 respondents offered items which were considered to be appropriate for adding to the list of distress items: loneliness (2), mental state, and memory. The range of additional items mentioned by these 28 respondents does suggest that factors other than health-related ones are being considered, and this may explain the limited capacity of the feelings items to explain more of self-rated distress (gv33).

DISCUSSION

The HMQ was designed as a means of obtaining self-reported information capable of being processed to yield Rosser disability/distress categories. In its original published form, as described in the QALY Toolkit[14], little supportive evidence was presented, and the present paper reports more fully on the results obtained in analysing the survey data

Firstly, the reliability of responses to items within the HMQ was tested by comparing these with responses to similar questions posed earlier in the interview schedule. The results indicate some variations but not to any serious degree. It is not possible to know whether inconsistencies, when they occur, result from errors in responding to the HMQ, or to the questions in the core data set.

Secondly, the performance of the HMQ was judged against the NHP and GHQ, in order to assess its validity as a measure of health status (assuming both these measures themselves are 'valid' measures). The results provide strong grounds for convergent validity at the descriptive level. Rosser disability/distress categories derived from the HMQ correlate well with the NHP and GHQ. Additionally, when the Rosser valuations are substituted for the derived categories there is a strong association between these scores and the numeric item counts on the other external measures.

Finally, the 'feelings' items are linked with other variables within the HMQ which measure overall distress and quality of life. To the extent that these measures are themselves successful in capturing data on the domains they seek to represent, the HMQ appears to have construct validity too, since it correlates well with these.

The HMQ has also discriminated between groups, and would have been useful for identifying the subgroup of the general population who are in poor health, or who score highly on a psychiatric illness scale.

We could therefore conclude that the HMQ is a viable, valid measure of self-reported health status, and is suitable for use in the general population and may also be useful for investigating specific patient groups. However, while analysing the data, we were faced with a recurring dilemma: what is the 'gold standard' against which we are comparing the HMQ? There is no one health status instrument which stands out above the rest, that measures for certain the complexities of [health -related] 'quality of life', and thereby provides the definitive reference against which all other instruments can be assessed. Even comparing the HMQ against two recognised and well-used measures of outcome has its difficulties. The GHQ was originally designed as a screening test to detect psychiatric disorders, and thus focuses on psychological components of ill-health. The NHP, whilst intended as a population survey tool, covers the dimensions of health in more detail, but was designed as a profile measure, without combining dimensions to produce an overall figure for health status. Neither instrument is therefore strictly comparable to the HMQ (or the Rosser Classification). The ones that may be more similar, such as the SIP[8] or QWB,[21] have not been designed for self-completed use, and have been developed outside the UK.

Regression analysis identified several main factors contributing to overall distress i.e. pain, sadness/depression and dependence on others. These results have to be viewed with some caution however, as some of the individual items are highly correlated with each other. Furthermore, only 43% of the variance is explained by the variables included in the model. Although it appeared that many respondents were thinking about factors other than strictly health-related ones, it is a reminder of the differences in interpretation that can be encountered with self-completion instruments. Clearly 'distress' has different meanings for different people, as has 'state of health'. Again there is the dilemma between providing sufficient

information to ensure that comparable data is collected, and producing an overly detailed, lengthy questionnaire that biases answers (as the inclusion of example answers may do for instance).

A useful addition to the study would have been to ask respondents to also rate themselves on the two original Rosser categories of disability and distress - this would have allowed a more direct assessment of the algorithm for converting the HMQ data into Rosser categories. Given the difficulty that some respondents had in completing the distress section of the HMQ, this is an area in the design of the questionnaire that could bear closer scrutiny.

The NHP has been used widely as a population survey tool, despite its weakness of being relatively insensitive to milder levels of dysfunction. Similarly, the GHQ was not designed as a measure of general health status and despite its usefulness as a tool in measuring psychological well-being, can only make a limited contribution in the wider measurement of health status. The HMQ has its own strengths and weaknesses, however it may be considered useful as a general measure of health status to be used alongside other such measures.

It is evident that there is considerable morbidity within the community (45% of respondents reported long-standing illness, and one-third were on regular medication), as well as widespread identifiable risk factors for future disease (30% were smokers and 42% were overweight). Although these figures are self-reported, they tally with results from surveys such as the GHS. These data reinforce the need for continued measurement of health status within the general population, with the dual aim of identifying areas of need, and then

monitoring improvement as services are adjusted to meet that need. These services may be hospital or community-based (or may take the form of consciousness-raising as part of health education), but they share a common requirement in that they need to be assessed in terms of their benefit. Health status measures such as the HMQ offer the prospect of such measurement.

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FIGURE 1: ROSSER'S CLASSIFICATION OF ILLNESS STATES

Disability		Distress
I	No disability	A. No distress
II	Slight social disability	B. Mild
III	Severe social disability and/or slight impairment of performance at work Able to do all housework except very heavy tasks	C. Moderate D. Severe
IV	Choice of work or performance at work very severely limited Housewives and old people able to do light housework only but able to go out shopping	
V	Unable to undertake any paid employment Unable to continue any education Old people confined to home except for escorted outings and short walks and unable to do shopping Housewives able only to perform a few simple tasks	
VI	Confined to chair or to wheelchair or able to move around in the house only with support from an assistant	
VII	Confined to bed	
VIII	Unconscious	

FIGURE 2: ROSSER'S VALUATION MATRIX: ALL 70 RESPONDENTS

DISABILITY RATING	DISTRESS RATING			
	A	B	C	D
I	1.000	0.995	0.990	0.967
II	0.990	0.986	0.973	0.932
III	0.980	0.972	0.956	0.912
IV	0.964	0.956	0.942	0.870
V	0.946	0.935	0.900	0.700
VI	0.875	0.845	0.680	0.000
VII	0.677	0.564	0.000	-1.486
VIII	-1.028	NOT APPLICABLE		

Fixed points: Healthy = 1 Dead = 0

TABLE 1: SOCIODEMOGRAPHIC CHARACTERISTICS OF THE STUDY POPULATION COMPARED TO THE BRITISH POPULATION

(Data for Great Britain are from the 1984 General Household Survey[6] except for data on socio-economic status and economic status which come from 1981 Census.[18]

All figures are percentages; columns may not add up to 100% due to missing data)

	Study Population (n=407)	Great Britain
AGE (years)		
15-24	11.8	16.7
25-44	34.7	35.9
45-64	33.3	28.2
65-74	13.3	11.5
75+	6.9	7.7
MALE	45.1	48.6
FEMALE	54.7	51.4
SOCIO-ECONOMIC GROUP		
I	2.5	2.5
II	12.8	14.6
III Non-Manual	25.6	14.8
III Manual	38.2	17.2
IV	12.8	13.0
V	2.2	4.6
Never worked	1.7	-
Student	1.2	4.2
Other (housewife, armed forces, inadequate description)	3.0	29.0

	Study Population (n=407)	Great Britain
ECONOMIC STATUS		
Full-time job	33.3	45.6
Part-time job	11.1	9.4
Seeking work	8.6	5.2
Sick/disabled	4.7	2.6
Retired	17.7	11.4
Keeping House	23.2	21.3
In education	1.2	4.3
BUYING/BOUGHT OWN HOUSE	46.8	59.0
OWN/USE OF A CAR	61.6	62.0
PROBABLE ETHNIC GROUP		
White	85.7	91.0
Asian	11.1	)
Afro-Caribbean	2.0	) 4.0
Missing	0	5.0

TABLE 2: HEALTH CHARACTERISTICS AND BEHAVIOUR OF STUDY POPULATION (n=407)

(all figures are percentages)

Has Long-Standing Illness	44.5
Is on regular medication	33.7
Body Mass Index:[1]	
underweight (<20)	11.8
acceptable/normal (20-24)	40.5
overweight 25+	42.3
missing	5.4
Plays sport regularly	23.6
Current Smoker[2]	
Ex-Smoker	29.5
Never-Smoked	29.2
	41.3

1 Body mass index: weight (Kg) divided by height (m) squared.

2 Data on quantitities consumed were collected in the survey but not used in this analysis.

TABLE 3: DISTRIBUTION OF RESPONDENTS ACCORDING TO ROSSER DISABILITY AND DISTRESS CATEGORIES

(Rows represent levels of disability, I = no disability, VI = confined to chair; columns represent levels of distress, A = no distress, D = severe distress. Figures are numbers of respondents, with row and column percentages in brackets. Data from 17 respondents were incomplete and therefore could not be used to derive disability and distress categories).

	DISTRESS				
	A	B	C	D	TOTAL
DISABILITY					
I	187	60	30	14	291 (74.6%)
II	12	13	8	6	39 (10.0%)
III	10	4	11	7	32 (8.2%)
IV	0	0	3	3	6 (1.5%)
V	4	3	7	7	21 (5.4%)
VI	0	0	0	1	1 (0.3%)
TOTAL	213 (54.6%)	80 (20.5%)	59 (15.1%)	38 (9.7%)	390

TABLE 4: EFFECT OF BACKGROUND VARIABLES ON ROSSER SCORE

(Analysis used t-tests, the left hand column shows how variables were divided into two groups, the right hand column shows the mean Rosser scores and p value of significant results).

VARIABLE	T-TEST p		
AGE (15-45 years vs 46+ years)	0.988	0.971	0.011
SEX (Male vs Female)		-	
ETHNIC GROUP (White vs Non-white)		-	
SCHOOL LEAVING AGE (minum/never to school vs more than 1 year over minimum age)	0.976	0.995	<0.001
SOCIAL CLASS (I to III(NM) vs III(M) to V)	0.991	0.971	0.002
BUYING OWN HOME (Yes vs No)	0.987	0.972	0.016
OWN/USE OF CAR (Yes vs No)		-	
NO. RELATIONS IN SAME HOUSE (0/1 vs 2+)		-	
USUAL ACTIVITY (sick/disabled/seeking work vs all others)	0.985	0.941	0.001
SMOKING (never vs ex/current)	0.988	0.973	0.009
REGULAR PHYSICAL EXERCISE (Yes vs No)	0.989	0.976	0.021
Body Mass Index (20-24 vs under 20/over 24)	0.989	0.972	0.008
LONG STANDING ILLNESS (Yes vs No)	0.962	0.993	<0.001
REGULAR MEDICATION (Yes vs No)	0.953	0.992	<0.001
LIMITED BY ILLNESS IN PAST 2 WEEKS (Yes/No)	0.949	0.986	0.017

TABLE 5: RATING OF OWN HEALTH STATUS: COMPARING RESPONSES TO HEALTH RATING QUESTIONS WITH RESPONSES TO VISUAL ANALOGUE SCALES IN HMQ

(AV14: 'Over the last 12 months, would you say that your health has, on the whole, been excellent, good, fairly good or not good?'

GV33: 'How much does your state of health distress you overall?'

GV34: 'How would you rate your overall quality of life?'

Figures represent number of respondents in each cell).

	Overall Distress (GV33) Score on VAS		Overall QoL (GV34) Score on VAS	
Health over last year (AV14)	0-60	61-100	0-60	61-100
Excellent or Good	225	4	223	6
Fairly Good or Not Bad	128	47	140	35
Sensitivity	29%		20%	
Specificity	98%		97%	
	$\chi^2 = 56.7$ $p < 0.001$		$\chi^2 = 32.9$ $p < 0.001$	

TABLE 6: DISTRIBUTION OF DERIVED DISABILITY/DISTRESS CATEGORIES IN 2 SUBGROUPS

DISABILITY/DISTRESS CATEGORY	"Healthy" (n=283)	"Not-healthy" (n=107)
Disability	%	%
I	84.5	48.6
II	8.1	15.0
III	4.9	16.8
IV	(0.4)	4.7
V	2.1	14.0
VI	-	(0.9)
	($\chi^2 = 62.816$, df = 5, $p < 0.001$)	
Distress		
A	63.3	31.8
B	20.5	20.6
C	11.0	26.2
D	5.3	21.5
	($\chi^2 = 46.864$, df = 3, $p < 0.001$)	

TABLE 7: MEDIAN GHQ SCORE FOR EACH ROSSER DISABILITY AND DISTRESS CATEGORY

(Data on distress were incomplete for 6 respondents)

DERIVED ROSSER DISABILITY CATEGORY	NO. RESPONDENTS	GHQ SCORE	
		Median	IQ Range*
I	162	0.0	0-1.0
II	20	0.5	0-2.0
III	17	0.0	0-1.5
IV	4	2.5	0-8.0
V	7	2.0	0-8.0
VI	0	-	-
DERIVED ROSSER DISTRESS CATEGORY			
A (None)	117	0.0	0-0
B (Mild)	41	1.0	0-2.0
C (Moderate)	25	2.0	0-5.5
D (Severe)	21	3.0	0.5-8.0

* Interquartile Range

TABLE 8: DISTRIBUTION ON ROSSER DISABILITY/DISTRESS MATRIX OF RESPONDENTS CONSIDERED TO BE 'PSYCHIATRIC CASES' ACCORDING TO THE GHQ

(Figures represent numbers of respondents in each combination of disability and distress; incomplete data for one respondent)

	Distress			
Disability	A None	B Mild	C Moderate	D Severe
I	1	5	6	3
II	-	-	1	2
III	-	-	-	3
IV	-	-	-	1
V	-	1	1	1

TABLE 9: OVERALL AND INDIVIDUAL COMPONENT SCORES ON THE NHP FOR EACH ROSSER DISABILITY AND DISTRESS CATEGORY

(Data on disability incomplete for 1 respondent and on distress incomplete for 8 respondents)

Rosser Disability Category	No. Respondents	MEDIAN SCORE FOR EACH NHP CATEGORY: PM	PA	S	E	SI	ER	Median Score for Overall NHP	IQ Range
I	149	0	0	0	0	0	0	1.0	0- 3.5
II	19	1	1	2	0	0	2	6.0	3.0-13.0
III	17	1	1	1	2	0	2	12.0	6.5-15.5
IV	5	6	7	4	2	1	5	23.0	19.0-31.5
V	15	4	4	3	2	1	4	17.0	10.0-26.0
VI	1	8	8	5	3	0	4	28.0	-

Rosser Distress Category	No. Respondents	MEDIAN SCORE FOR EACH NHP CATEGORY: PM	PA	S	E	SI	ER	Median Score for Overall NHP	IQ Range
A (None)	108	0	0	0	0	0	0	1.0	0- 3.0
B (Mild)	39	0	0	0	0	0	1	3.0	1.0- 6.0
C (Moderate)	33	1	1	2	1	0	2	11.0	4.0-17.0
D (Severe)	18	3.5	5	3.5	2	1	5.5	21.0	5.0-27.25

PM = Physical Mobility; PA = Pain; S = Sleep; E = Energy; SI = Social Isolation; ER = Emotional Reactions

TABLE 10: POSITIVE RESPONSES TO NHP ITEMS

Abbreviated NHP Statements	Wolverhampton (%)	York[20] (%)
Wake early	49	59
Soon run out of energy	28	25
Long time to sleep	26	27
Getting me down	25	19
Tired all time	25	16
Lose temper	24	28
Hard to stand	23	17
Feeling on edge	23	17
Pain at night	23	13
Sleep badly	22	22
Forgotten enjoy	21	8
Days drag	18	14
Pain when walk	18	12
Everything an effort	18	8
Difficulty bending	17	15
Lie awake	17	10
Pain - stairs	17	8
Hard - stairs	16	11
Pain - change of position	16	9
Wake depressed	16	8
Hard to reach	15	9
Pain standing	14	11
Lonely	14	10
Worry at night	12	10
Walk only indoors	11	8
Pain sitting	11	7
Unbearable pain	11	5
Constant pain	10	5
Losing control	9	3
Tablets to sleep	8	8
Hard to contact with people	8	8
Nobody close to	8	6
Burden	8	5
Help to walk outside	8	4
Hard to dress	8	2
Life not worth living	8	2
Hard to get on with people	5	5
Can't walk at all	3	2

TABLE 11: DISTRIBUTION OF NHP SCORES IN 2 SUBGROUPS

(NHP data missing for 3 'healthy' respondents and 1 'not-healthy' respondent)

NHP Score	"Healthy" (n=280)	"Not healthy" (n=106)
0	66.4	50.0
1-2	16.1	5.7
3-11	14.3	18.9
12+	3.2	25.5
	(χ^2 = 51.541, df = 3, p<0.001)	

TABLE 12: DISTRIBUTION OF GHQ SCORES IN 2 SUBGROUPS

GHQ Score	"Healthy" (n=283)	"Not healthy" (n=107)
	%	%
3 or lower	97.9	82.2
Greater than 3	2.1	17.8

($\chi^2 = 31.645$, df = 2, $p < 0.001$)

TABLE 13: CORRELATIONS BETWEEN 'FEELINGS' ITEMS (SPEARMAN'S ρ)

	Sad Depn	Anx Worry	Pain	Sick	Breath -less	Sleep	Tired	Appear -ance	Incont- inence	Embarr -asst	Future	Anger	Guilt	Self Confn	Dept on Others
Sad/Depressed	-														
Anxious/worried	0.68	-													
Pain	0.30	0.42	-												
Sickness	0.28	0.21	0.15	-											
Breathless	0.29	0.19	0.35	0.08	-										
Difficulty sleeping	0.44	0.41	0.48	0.18	0.29	-									
Tiredness	0.51	0.52	0.42	0.24	0.31	0.56	-								
Dissatisfaction with Appearance	0.17	0.22	0.11	0.08	0.12	0.18	0.22	-							
Incontinence	0.17	0.16	0.08	-0.13	0.30	0.02	0.19	-0.03	-						
Embarrassment	0.26	0.26	0.21	0.27	0.09	0.14	0.25	0.16	0.20	-					
Uncertainty about Future	0.36	0.42	0.18	0.11	0.11	0.31	0.42	0.14	0.02	0.25	-				

	Sad Depn	Anx Worry	Pain	Sick	Breath -less	Sleep	Tired	Appear -ance	Incont- inence	Embarr -asst	Future	Anger	Guilt	Self Confn	Dept on Others
Anger or Resentment	0.42	0.38	0.04	0.13	0.09	0.27	0.27	0.08	0.04	0.25	0.38	-			
Guilt	0.30	0.24	0.07	0.21	0.07	0.24	0.29	0.19	0.11	0.31	0.29	0.29	-		
Loss of Self Confidence	0.43	0.37	0.27	0.31	0.20	0.30	0.39	0.33	-0.01	0.41	0.39	0.30	0.30	-	
Dependent on Other People	0.27	0.29	0.35	0.11	0.36	0.32	0.25	0.17	0.19	0.28	0.29	0.16	0.17	0.32	-
Dependent on Machine	0.23	0.22	0.28	0.36	0.14	0.17	0.23	0.02	0.02	0.32	0.20	0.11	0.25	0.36	0.31

APPENDIX 1: HEALTH MEASUREMENT QUESTIONNAIRE

SCHEDULE 'G'

SELF-COMPLETED QUESTIONNAIRE

(Sample questionnaire, not to scale)

GENERAL MOBILITY

Which of the following best describes your situation?

Tick one only.

I can get outdoors on my own with no great difficulty ☐

I can get outdoors on my own but only with difficulty, e.g. using stick, frame, crutch or wheelchair ☐

I can get about in the house on my own but I can only get outdoors with someone's help ☐

I am chairbound ☐

I am bedridden ☐

SELF-CARE

Do you need help with

Washing yourself?	Yes	☐	No	☐
Dressing?	Yes	☐	No	☐
Eating or drinking?	Yes	☐	No	☐
Using the toilet?	Yes	☐	No	☐

USUAL ACTIVITIES

1. Of the following, which is now your usual main activity?
Tick one only.

Paid employment	☐
Housework	☐
Studying	☐
Retired	☐
Unemployed	☐
Other (please specify .....)	☐

2. Has your current state of health forced you to change your usual activity?

_____ Yes ☐

_____ No ☐

3. If YES, what was your usual activity before?
Tick one box only.

Paid employment ☐

Housework ☐

Studying ☐

Retired ☐

Unemployed ☐

Other
(please specify .....) ☐

4. If NO, have you had to cut down on your level of activity?

Yes ☐

No ☐

5. If your current state of health has affected your usual activity, how seriously do these work changes affect your life?

Mark a cross on the line

SOCIAL AND PERSONAL RELATIONSHIPS

Does your state of health seriously affect any of the following?

your social life?	Yes	☐	No	☐
seeing friends or relatives?	Yes	☐	No	☐
your hobbies or leisure activities?	Yes	☐	No	☐
your sex life?	Yes	☐	No	☐

6. Has your financial situation been affected by your current state of health?

Yes ☐

No ☐

If YES, please mark the line below.

FEELINGS

Over the last two weeks have you experienced any of these feelings? If so, how much distress have they caused you?

	No	Yes	NO DISTRESS AT ALL — EXTREME DISTRESS
Feeling sad or depressed	☐	☐	0 — 10
Feeling anxious or worried	☐	☐	0 — 10
Pain	☐	☐	0 — 10
Feeling sick	☐	☐	0 — 10
Breathlessness	☐	☐	0 — 10
Difficulty sleeping	☐	☐	0 — 10
Tiredness	☐	☐	0 — 10
Dissatisfaction with your appearance	☐	☐	0 — 10
Incontinence (i.e. lack of control over bladder or bowel movements)	☐	☐	0 — 10
Embarrassment	☐	☐	0 — 10
Uncertainty about the future	☐	☐	0 — 10
Anger or resentment	☐	☐	0 — 10

	No	Yes	NO DISTRESS AT ALL — EXTREME DISTRES
Guilt	☐	☐	0 — 1
Loss of self-confidence	☐	☐	0 — 1
Feeling dependent on other people	☐	☐	0 — 1
Feeling dependent on a machine	☐	☐	0 — 1
Any other problems that cause you distress?	☐	☐	0 — 1

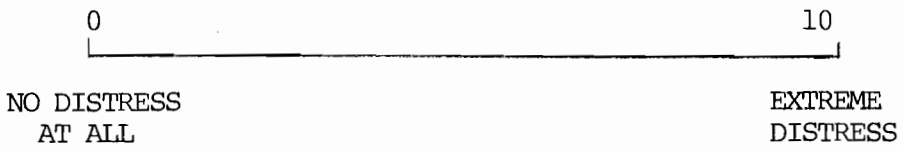
Please specify

_____

_____

How much does your state of health distress you overall?

Mark a cross on the line



SUMMARY

How would you rate your overall quality of life?

Mark a cross on the line.

EXTREMELY GOOD

EXTREMELY BAD

What aspect of your state of health upsets you most?

_____

_____

_____

APPENDIX 2: ALGORITHM FOR CONVERTING THE HMQ (WOLVERHAMPTON) INTO ROSSER DISABILITY AND DISTRESS CATEGORIES.

(N.B. The questionnaire used in this Wolverhampton study is an earlier version than that reported in the QALY Toolkit[14])

DISABILITY

The format of the disability questions and their subsequent mapping into the Rosser scale was straightforward. The questions covered both social and physical disability as described in the Rosser Index.

Coding:

"General Mobility" responses are already coded (GM) 1 to 5 in the questionnaire.

"Self-care" responses are scored 1 for each 'YES' response (possible range of scores for SC is thus 0 to 4).

"Usual activities" responses are coded as not affected at all (if 'NO' answered to both Q2 and Q4) or changed (if 'YES' answered to either Q2 or Q4).
UA5: measure the position of the cross on the 10cm visual analogue scale in mm, with 0 at left end and 100 at right end. Treat this as the score showing how serious any work changes have been.

"Social and personal relationships" responses are scored 1 for each 'YES' response (possible range of scores for SP is thus 0 to 4).

Assignment Rules:

In the table below, first move to the appropriate COLUMN, using the General Mobility responses. For GM3 to GM5, no further information is required, the Rosser categories being IV, VI and VII respectively.

For GM1 and GM2, start with the "Usual Activity" responses.

If UA has not been affected at all, either the first or the third rows will be relevant, depending on the levels of SC and SP. If UA has changed, and the respondent is now unemployed or 'other' (e.g. disabled, on sickness benefit), the Rosser category will be V. If UA has changed and UA5 > 49, the Rosser category will be III or IV.

If either SC or SP is greater than 2, the Rosser category will be III or IV.

Other Responses \ GM	1	2	3	4	5
UA not affected at all, SC=0 AND SP=0	I	III			
UA changed BUT not currently unemployed or other	II	III			
SC=1 or 2 AND SP=1 or 2 AND UA5 < 50	II	III			
SC=3 or 4 OR SP=3 or 4 OR UA 5 ⩾ 50	III	IV	IV	VI	VII
UA changed and currently unemployed or other	V	V			

DISTRESS

The guidelines for distress were less easy to determine however, since Rosser defined distress as

(1) Pain

(2) Mental distress i.e. anxiety, depression, and other suffering

(3) reaction to disability

The HMQ offers an opportunity to explore this concept of distress further, in an attempt to identify its main components. The questionnaire contains a list of items broadly relating to 'feelings' which respondents are asked to report on, as well as a summary question about their present level of overall distress. The 16 'feelings' items are derived from several sources. Items in the GHQ,[16] NHP,[7] the Sickness Impact Profile[8] and the Quality of Well-Being Scale[21] were assessed as to their relevance to 'distress', together with items that had been identified previously in Rosser's original psychometric experimentation. The inclusion of the self-report question on overall distress allows these individual items to be assessed with regard to their relevance to the general domain labelled 'distress'.

The Rosser Index categorises distress into four ordinal levels i.e. 'none', 'mild', 'moderate', and 'severe' distress, while the responses to the HMQ are made on visual analogue scales which generate a numerical score. The essential task is therefore to convert these numeric scores across several items into the four levels of distress.

From the original Rosser definition of distress, it was clear that the three items of pain, anxiety, and depression were main factors. The five items of sickness, breathlessness, difficulty sleeping, tiredness, and incontinence were excluded from the algorithm as they were considered to be physical symptoms which could cause distress, rather than being feelings of distress themselves. The remaining eight items were included.

The cut-off points for distress were assigned at 30/60/90, to represent the categories of none (0-30), mild (31-60), moderate (61-90) and severe (91-100).

Coding: for each distress item, measure position of cross on the 10cm visual analogue scale in mm, with 0 at left end and 100 at right end. Treat this as the score for that item.

Assignment Rules:

The feelings items have been numbered 1 to 16.

In the table below, first move to the appropriate COLUMN, using the responses to the first three items (i.e. sad/depressed, anxious/worried, and pain).

Move next to the appropriate ROW, depending on the responses to item B (dissatisfaction with appearance) and items 10 to 16.

Feelings 1,2,3

Feelings 8,10 → 16	ALL ⩽ 30	Any One or All 31 → 60	Any One or All 61 → 90	Any One or All 91 → 100
ALL ⩽30	A	B	C	D
ANY ONE OR ALL 31 → 60	B	B	C	D
ANY ONE OR ALL 61 → 90	C	C	C	D
ANY ONE OR ALL 91 → 100	D	D	D	D